BEFORE THE
FEDERAL COMMUNICATION COMMISSION
WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
Advanced Television Systems	)	
and Their Impact upon the	)	MM Docket No. 87-268
Existing Television Broadcast	)	
Service	)	

Comments of
Ericsson Inc. on the
Sixth Further Notice Of Proposed Rule Making

Ericsson, Inc.
1634 Eye Street, N.W.
Washington, D.C. 20006-4083
202-783-2200

November 22, 1996

Executive Summary

Ericsson Inc. (Ericsson), with nearly 7,000 employees in the United States, is an active participant in the U.S. wireless communications marketplace. Its Private Radio Systems operation in Lynchburg, Virginia, is a major supplier of public safety land mobile radio equipment and systems. As a major provider of wireless equipment and systems and recognizing the importance of effective and efficient public safety wireless communications to the safety of life and property and, to law enforcement functions, Ericsson is pleased to submit these comments in response to the Further Notice.

Ericsson has identified two principle issues on which it wishes to offer its views:

- the core channel plan and
- the concept of locating all advanced TV in UHF frequencies.

Ericsson strongly supports the core area concept. While Ericsson feels that the core area concept is excellent, it might be modified to offer even more value. Two specific changes are possible. First, rather than attempting to free only that spectrum at the top of the UHF band, the Commission should also consider freeing spectrum at the lower UHF TV band. Second, substantial long-run benefits could be generated by leaving TV channels 7 and 8 out of the core area.

Ericsson also believes it important to note that, while the greater robustness of digital signals should allow digital stations to be packed more tightly than analog stations, the FCC's draft channel plan associates 1,663 DTV stations with a core area of 44 UHF channels — a density of about 38 DTV stations per channel. The current NTSC channel plan in the VHF band supports slightly more than 56 stations per channel. If the posttransition core region were packed as tightly as are NTSC VHF stations today, then only about 30 channels (180 MHZ) would be needed to accommodate DTV. If DTV technology does permit tighter packing than NTSC, then DTV should be able to be accommodated in even less spectrum. Ericsson urges the Commission to carefully study the design of the core area and to see if it can be shrunk without imposing excessive relocation costs on broadcasters at the end of the transition.

DTV has been characterized by some as a spectrum giveaway to the broadcasters. But, **if properly managed, DTV will be a giveback — not a giveaway** — DTV will free up spectrum from broadcast uses while leaving broadcasters whole! DTV will allow our society to move from the excellent, but now outdated, analog broadcast technology to a modern and efficient digital technology. Because the new technology will allow more efficient packing of DTV than the older analog technologies, broadcasters can be kept whole with a 6 MHZ channel, while society receives a spectrum dividend. The FCC should move now to implement DTV and should put in place policies that speed the transition to digital television. Broadcasters, consumers, and other spectrum users all are harmed by delay in FCC decision making on DTV.

Table of Contents

RECEIVED

NOV 2.1 1996

FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF SECRETARY

BEFORE THE
FEDERAL COMMUNICATION COMMISSION
WASHINGTON, D.C. 20554

In the Matter of	)	
	)	
Advanced Television Systems	)	
and Their Impact upon the	)	MM Docket No. 87-268
Existing Television Broadcast	)	
Service	)	

Comments of Ericsson Inc. on the Sixth Further Notice Of Proposed Rule Making

I. Introduction

The Sixth Further Notice is one of the last steps in the arduous process of transforming our analog television system, defined roughly a half century ago, into a flexible digital information-distribution service that will expand and improve picture and sound quality, expand the range of alternatives available to most consumers, and probably provide many useful non-video services. Ericsson Inc. (Ericsson), with nearly 7,000 employees in the United States, is an active participant in the U.S. wireless communications marketplace. Its Private Radio Systems operation in Lynchburg, Virginia, is a major supplier of public safety land mobile radio equipment and systems. As a major provider of wireless equipment and systems, and recognizing the importance of effective and efficient public safety wireless communications to the safety of life and property and to law enforcement functions, Ericsson is pleased to submit these comments in response to the Further Notice.

Ericsson is recognized as an international leader in the telecommunications industry with 85,000 employees worldwide and business partnerships in more than 100 countries. It is highly

active in research and development and generated $15 billion in net sales in 1995. Approximately 40 percent of the world's mobile telephone subscribers are connected to Ericsson-supplied systems. Ericsson's presence in the United States dates back to the turn of the century. In 1989, Ericsson and General Electric formed a joint venture named Ericsson GE Mobile Communications Inc. (EGE). In 1995, the EGE name was formally changed to Ericsson Inc. Ericsson Inc. (USA) is headquartered in Richardson, Texas, and (as noted above) employs approximately 7,000 in the United States.

In the Sixth Further Notice, the Commission seeks comments on the draft channel plan for DTV and on the policies that should underlie the perfection and future use of that channel plan. Ericsson comes to this issue from a land-mobile system supplier's perspective, with a particular focus on public safety needs. During this last year, the Public Safety Wireless Advisory Committee (PSWAC) prepared its report.[1] Representatives of Ericsson participated in all of the formal meetings of the Advisory Committee and its various subcommittees as well as in countless informal working group meetings. Our long-term experience in the public safety market together with our participation in the PSWAC process has made Ericsson acutely aware of the public safety community's needs for additional spectrum.[2]

Ericsson has identified two principle issues raised by the Commission in the Further Notice on which it wishes to offer its views. These issues are:

- the core channel plan and
- the concept of locating all advanced TV in UHF frequencies.

---

[1] Final Report of the Public Safety Wireless Advisory Committee to the Federal Communications Commission and the National Telecommunications and Information Administration, September 11, 1996.

[2] Ericsson recognizes that other steps are needed, as well — such as rapid adoption of more spectrally efficient technology in urban areas. However, the PSWAC report establishes that even if public safety moves quickly to implement spectrum efficient technology, there still remains a need for substantial additional spectrum to meet public safety mobile communications needs.

In addition, Ericsson offers its views on the rules that should govern unused ATV allotments.

II. The Concept of Core Channels Is Sound and Should Be Adopted

In paragraph 35 of the Further Notice, the Commission asks for comments on the "core area" option. Briefly put, Ericsson strongly supports the core area concept. As described below, Ericsson believes that it is highly likely that slight modifications to the core area concept will substantially increase the benefits it would bring. Nevertheless, even absent such changes, the core area concept is sound and should be implemented.

As is well known by many in the spectrum management field, the UHF TV band is only lightly used. The 55 UHF channels have a nationwide average of about 18 stations per channel, while the 12 VHF channels have a nationwide average of about 58 stations per channel.[3] The loose packing of TV stations in the UHF spectrum reflects the receiver and modulation technologies available and affordable a half century ago. With today's technology, it would be possible to repack the UHF broadcast spectrum, freeing up radio spectrum for other uses or additional broadcast channels. Immediate and total repacking would be both expensive and difficult. However, the advent of the digital television age creates a natural opportunity to accomplish gradual repacking. Stations using modern digital modulation can be packed more tightly together than could analog stations in the early 1950s. Consequently, as broadcasters transition to digital they can be given stations that replicate their existing service areas, allow them to transmit a digital signal that can carry high-definition TV or multiple standard definition signals, but that all together occupy a smaller block of spectrum (the core area).

---

[3] Figures derived from the channel numbers in the Draft Channel Plan in the NPRM listing 694 VHF stations and 969 UHF stations. The count of 55 UHF channels (14 to 69) excludes channel 37. Note that one or two UHF channels are used for land mobile communications in some of the nation's largest markets. These land mobile operations are on channels that were not used for NTSC television due to the UHF taboos.

Such a repacking is the heart of the FCC's core area option. The FCC's proposed core area plan would consist of two stages. In the first stage, or the transition period, analog transmissions would continue as digital transmitters came on the air. In the second stage, after the transition period, analog transmissions would cease and digital TV transmissions would all be located in the core area. With careful selection of the initial digital channels, it may be possible to gain the benefits of repacking the UHF spectrum, while avoiding the high costs of relocating stations.

The Further Notice sets out a proposed core area consisting of channels 7-13, 14-36, and 38-51 for a total of 44 channels or 264 MHZ of spectrum. Ericsson believes that it is highly likely that a smaller core area could provide all broadcasters with DTV facilities comparable to their existing NTSC facilities.

Digital signals are normally more interference-resistant than are analog signals. DTV is no exception. For example, Appendix A of the Further Notice shows system parameters used for planning purposes. According to Appendix A, a cochannel DTV signal needs to be only 15.27 dB stronger than an undesired interfering DTV signal to permit acceptable performance. In contrast, a cochannel NTSC signal needs to be 34.44 dB stronger than an undesired interfering DTV signal to permit acceptable performance. In layman's language, the digital signal is much more robust — able to tolerate an interfering signal almost 100 times stronger than an analog signal can. The DTV signal is also more benign — it spreads its energy out more evenly than does an NTSC, signal making it a less objectionable source of interference.[4]

---

[4] There are other indications that DTV can be packed more tightly than NTSC. For example, in paragraph 98 of the Further Notice, the FCC notes that the UHF taboos must be considered when considering DTV to NTSC interference but not for DTV to DTV interference. In that same paragraph the Commission sets forth a DTV to NTSC cochannel separation factor that is 10 percent higher for DTV — NTSC station separation than for DTV — DTV station separation. But, a 10 percent greater separation results in 20 percent greater buffer **area.** Thus, an all DTV plan should pack tighter than a mix of DTV and NTSC stations.

The greater robustness of digital signals should allow digital stations to be packed more tightly than analog stations. But, the core area concept in the FCC's draft channel plan associates 1,663 DTV stations with a core area of 44 UHF channels — a density of about 38 DTV stations per channel. As described above, the current NTSC channel plan in the VHF band supports almost 58 stations per channel. If the posttransition core region were packed only as tightly as are NTSC VHF stations today, then only about 30 channels (180 MHz) would be needed to accommodate DTV. If DTV technology does permit tighter packing than NTSC, then DTV should be able to be accommodated in even less spectrum. Similarly, we note that any channel plan that provides each broadcaster with a digital channel will support roughly 3,300 TV stations (1,663 DTV, 1663 NTSC) using 67 TV channels. After the transition, there will be only half as many stations (1,663 DTV) and one would expect that they could be fit into half as many channels (34) or into even fewer than half as many channels — given the robust nature of the DTV signal.

Further support for this view can be gained by examining the FCC's draft channel plan. Figure 1 below shows the number of stations, both digital and analog, proposed for each channel. The lower portion of each bar represents the number of NTSC stations on the channel, the upper portion represents the number of DTV stations.

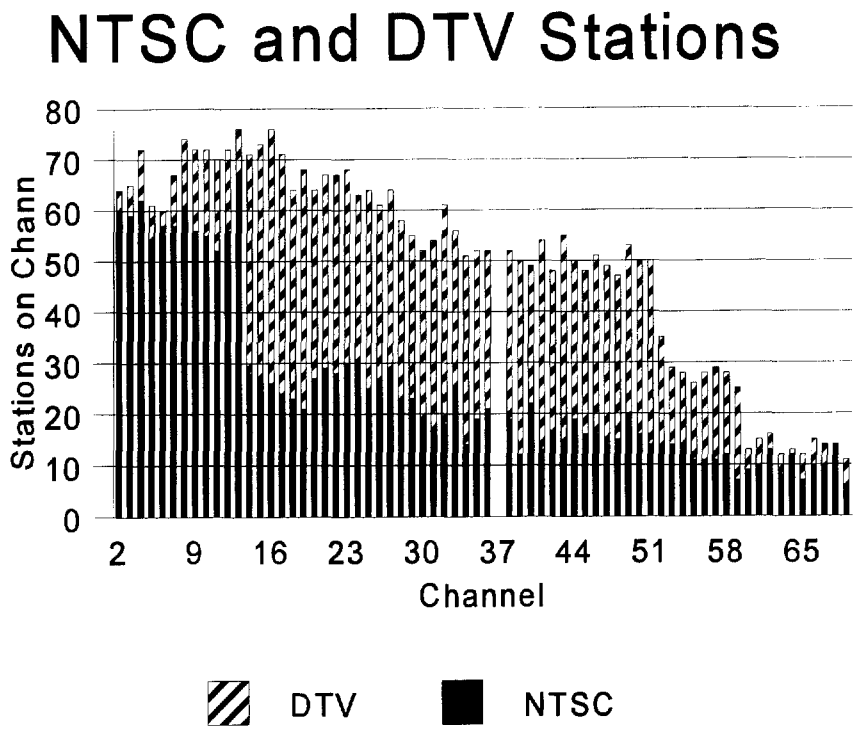


Figure 1

Examination of Figure 1 above makes it clear that roughly one third of the stations in the core are NTSC stations. Figure 2 below shows the DTV usage pattern alone.

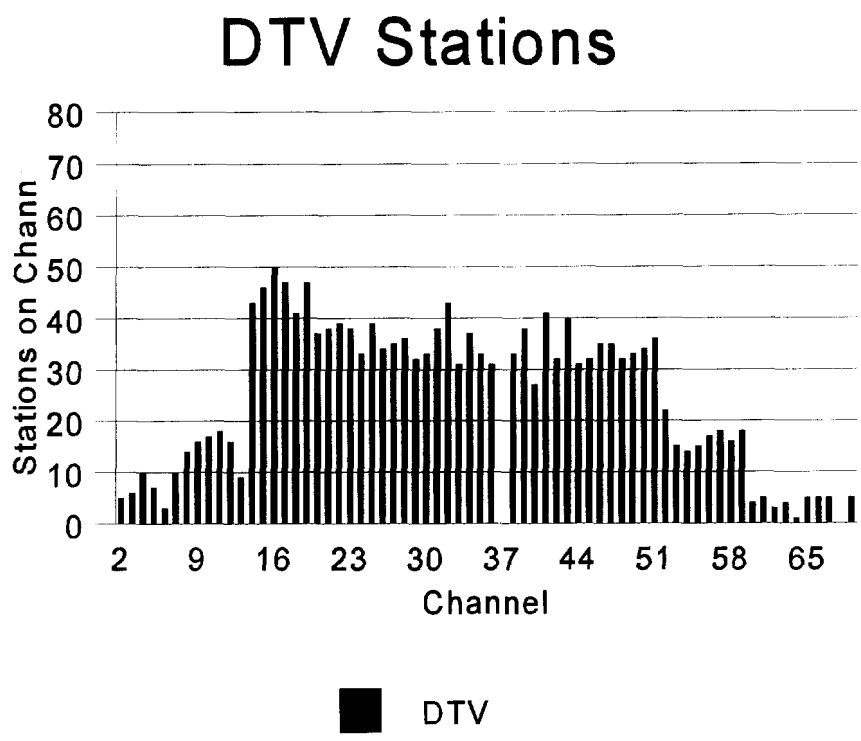


Figure 2

Looking at the digital channels alone, the core clearly stands out because the Commission's draft plan packs most of the DTV channels into the core. But, as can be seen by comparing the two figures, the DTV channels, even in the core, are less densely packed than are either the VHF NTSC stations or the combined DTV/NTSC stations during the transition. The FCC's draft channel plan packs 1,685 DTV and NTSC stations onto channels 20 to 52 inclusive during the transition period — a density of 55 stations per channel (less than VHF NTSC today).[5] If this same density were achieved for DTV stations after the transition, then all DTV could be contained in the 192 MHz of spectrum available using channels 20 through 52. Such a compact channel plan would ultimately free up more that 200 MHz of spectrum.

---

[5] The density is actually 54.7 (=1750/32) stations per channel. Recall that channel 37 is not used. For comparison, the FCC's draft channel plan shows 694 VHF stations on channels 2 to 13, or 57.8 stations per channel.

The discrepancy between our rough bounding calculations of the ultimate spectrum needed for DTV (about 30 channels) and the FCC's core area of 44 channels may well arise from a loose packing of the digital channels to allow them to fit around the existing NTSC channels. The difference of 14 channels or 84 MHz is a substantial amount of spectrum — worth literally tens of billions of dollars to our society. We urge the Commission to carefully study the design of the core area and to see if it can be shrunk without imposing excessive relocation costs on broadcasters at the end of the transition.

On a related issue, Ericsson questions whether a plan that reserves spectrum for broadcasters who do not use it is appropriate? The future of DTV is quite uncertain. Some broadcasters may lack the financial incentives to upgrade to digital. If so, their paired station allotments could remain idle. Ericsson believes that the Commission should plan explicitly for this contingency. For example, the Commission could, after broadcasters have had a chance to apply for their digital channels, revisit the core area concept, and perhaps even the channel plan, to see if the actual stations that will be implemented can be packed more efficiently. Even broadcasters that have committed to transitioning to digital may welcome an opportunity to move from a higher UHF to a lower UHF station — if such an opportunity presents itself.

III. Benefits of Core Concept

The primary benefit of the core area concept is to move to a more efficient use of the spectrum resource. Packing DTV in the core area would free up spectrum for other uses or even additional broadcast uses.

Public safety communications is one valuable use of that freed-up spectrum; it is likely to be the one of the most important. Some indication of the importance of public safety agencies having access to adequate spectrum can be gleaned from some basic statistics on (1) the amount of money spent on public safety services in the U.S. and (2) the losses in terms of lives and property that occurred despite those expenditures. For example, the U.S. Bureau of Census

reported that in 1992,[6] all levels of government spent the following amounts on these public safety-related activities:[7]

Police Protection	$41.2 B
Fire Protection	14.4 B
Corrections	31.0 B

Thus, as far back as 1992, the total cost of these public safety-related activities was over $85 billion and is likely to be well over $100 billion today. In addition, the National Fire Protection Association estimates that in 1995, fire caused $8.9 billion in direct property damage and resulted in 4,585 civilian deaths and 25,775 civilian injuries.[8] The Federal Bureau of Investigation reported the following losses from crime in 1995:[9]

Robbery	$0.5 B
Burglary	3.3 B
Larceny-Theft	4.3 B
Motor Vehicle Theft	7.6 B

A study recently released by the National Institute of Justice of the U. S. Department of Justice estimated that the annual cost of victim crime is $450 billion when medical expenses, lost

---

[6] The 1992 figures were the most recent available to us in the preparation of these comments.

[7] U.S. Bureau of Census, Series GF, No. 5. (Also see Statistical Abstract of the United States 1995, U.S. Department of Commerce, p. 300.)

[8] "1995 Fire Death Toll a Sobering reminder of the Nation's Vulnerability to Fire," National Fire Protection Association, August 15, 1996 (http://www.wpi.edu/Academics/Depts/Fire/Nfpa/newsrelease.html#1).

[9] "Crime in the United States," Federal Bureau of Investigation, U.S. Department of Justice, October 13, 1996 (http://www.fbi.gov/ucr95prs.htm).

earnings, pain and suffering, and other factors are included.[10] Finally, according to the Bureau of Labor Statistics of the U.S. Department of Labor, 174 police officers and detectives and 39 fire fighting and fire prevention personnel suffered fatal occupational injuries in 1995.[11]

A fundamental conclusion of the PSWAC Final Report is that "unless immediate measures are taken to alleviate spectrum shortfalls and promote interoperability, Public Safety agencies will not be able to adequately discharge their obligation to protect life and property in a safe, efficient, and cost effective manner." Given the basic statistics presented above, it is clear that even minor reductions in the safety, efficiency, and cost effectiveness of public safety agencies could have major economic consequences, while placing in jeopardy the lives of those individuals entrusted with protecting life and property. It is also clear that even small percentage reductions in these annual costs and the total annual costs of public safety activities would more than compensate for any reduction in one-time spectrum auction revenues that might be foregone by allocating additional spectrum for public safety purposes.

Traditional commercial applications are another use for freed-up spectrum. Future broadband and multimedia applications offer still another alternative for employing the freed-up TV spectrum. The market for these services does not exist today but will be there at the time when analog channels can be closed down. The upper part of the UHF band, say channels 65-69, together with the AMPS bands offer very interesting opportunities for establishing new global frequency bands for innovative multimedia services given that many countries around the globe are discussing freeing up UHF TV channels for other uses.

---

[10] "Victim Costs and Consequences: A New Look," National Institute of Justice Research Report, January, 1996 (http://www.ncjs.org/txtfiles/victcost.txt).

[11] "National Census of Fatal Occupational Injuries, 1995," Bureau of Labor Statistics, U.S. Department of Labor, August 8, 1996 (ftp://stats.bls.gov/pub/news.release/cfoi.txt).

We have the experience of PCS auctions to help us understand how valuable spectrum is. It is clear that commercial mobile services will become a much more competitive industry. Success will be determined, in large part, by how well firms compete, not merely by their access to spectrum. Even so, the 120 MHZ of PCS spectrum has generated auction revenues of roughly $20 billion! But, this $20 billion is not the proper measure of the value of that spectrum. The value is measured by the benefits consumers derive from the spectrum less the costs of producing those benefits, and every indication is that consumer benefits will far exceed the PCS auction revenues.

To summarize, ultimately providing substantial spectrum below 1.0 GHz for a variety of possible communications uses will benefit society enormously. The FCC's core area concept would serve well this important end.

IV. Modification of the Specific Set of Core Channels Offers Substantial Benefits

While Ericsson feels that the core area concept is excellent, it might be modified to offer even more value. Two specific changes are possible. First, rather than attempting to immediatey free only that spectrum at the top of the UHF band, the Commission should also consider freeing spectrum at the lower UHF TV band as well. Second, substantial long-run benefits could be generated by leaving TV channels 7 and 8 out of the core area.

The FCC suggested that the core area channels be the shaded blocks shown in Figure 3, below.

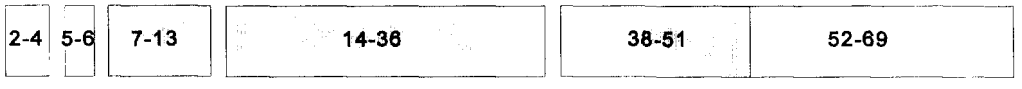


Figure 3. Proposed DTV Spectrum as in FNRPM (Shaded Areas)

This design of the core area misses an important opportunity. In another proceeding, John Powell has suggested that the core area be redefined to leave VHF channels 7 and 8 and UHF channels 14-18 outside the core area, as shown by the shaded blocks in Figure 4, below.[12]

Figure 4. Modified Core Area Proposal for DTV Spectrum (Shaded Areas)

Mr. Powell's suggestion regarding the core makes great sense and should be carefully considered by the Commission. There are extensive land-mobile operations on the spectrum directly below channel 7 and channel 14. Freeing-up additional spectrum for land-mobile use in adjacent bands would offer an opportunity to use the existing spectrum and infrastructure investment efficiently. Furthermore, radio transmissions on channels 7 and 8 can be received using larger antennas having a greater capture area than at higher frequencies, moreover signals at these frequencies are not blocked by hills and trees as much as are signals at higher frequencies. Hence, these lower frequencies are excellent for providing service to mobile units traveling over wide areas. Conversely, these frequencies are normally judged less appropriate for portable personal communications because of their reduced building penetration.

We note that channel 7 is used today by stations in 7 of the 10 largest broadcast markets. It would be extremely difficult and disruptive to relocate existing channel 7 operations. But, freeing channel 7 after the transition would be an entirely different matter. The Commission's draft channel plan puts only 10 DTV stations on channel 7 and 14 on channel 8. These stations

---

[12] Comments of John S. Powell, In the Matter of the Development of Operational, Technical, and Spectrum Requirements for Meeting Federal, State, and Local Public Safety Agency Communications Requirements Through the Year 2010, WT Docket 96-86, October 21, 1996, p. 22.

could be relocated and channels 7 and 8 left free of DTV. This would have dual benefits. First, the slight DTV interference to the existing NTSC service (properly weighted by viewership) would probably be further reduced during the transition. Second, at the end of the transition, these valuable frequencies would be available for use.

The Commission also asked for comment on their original proposal for an all-UHF DTV service. Ericsson thinks that an all-UHF DTV service would certainly be appropriate if the core can be reduced to 30 or so channels. However, with a larger core of 40 or more channels, it may be more efficient to keep some DTV in the upper VHF (say, channels 10-12) and thereby free-up more of the higher UHF regions for alternate uses.[13] Ericsson notes that putting all DTV in the UHF region from the beginning would eliminate all DTV interference with VHF stations during the transition. For both technological and historical reasons, these VHF stations tend to be the most highly viewed stations in many markets. Reducing interference to these stations would benefit consumers.

An all-UHF DTV channel plan would slightly simplify the design of DTV receiving systems. A UHF-only DTV set or adapter would only require one antenna connector and one RF tuning unit. Such simplification would be translated into easier to use, less costly consumer receiving equipment and/or better receiving equipment performance.

The FCC's draft channel plan put only 131 of 1,663 DTV assignments, or 8 percent of all DTV assignments, in the VHF band. Given the clear consumer benefits of putting the core in UHF and the slight contribution VHF makes to the DTV plan, Ericsson believes that the Commission should carefully consider an all-UHF DTV channel plan.

---

[13] The top end of the UHF TV band is adjacent to the 800 MHZ land mobile bands. Spectrum in this region can be used for a wide variety of applications including public safety communications.

V. Other Matters

At paragraph 33, the Commission rightly observes that the interference models it and others use to predict the interference effects associated with a DTV channel plan omit elements that would reduce the actual interference received by consumers. We agree with that observation. In particular, we note that cable systems can use sophisticated receiving equipment, e.g., antenna nulls, that reduces interference at cable headends (and thus to all cable subscribers) far below the levels predicted by the models used to predict interference to households. We also note that the combination of cable service (which is available to the vast majority of households in fringe areas) and satellite service (which is available to most households who do not have access to cable) may have changed the public interest balance. Society can afford to pack television channels more tightly, freeing up valuable spectrum urban areas, because the costs of added interference in fringe areas have been lowered by the availability and use of these other television delivery options.

VI. Concluding Thoughts

The coming of digital television presents a great opportunity for all the participants. While broadcasters will have to spend billions in order to gain the ability to transmit in digital, they gain in return the ability to deliver an improved product that in turn will help them compete with cable, satellite and other wireless digital delivery systems. Consumers will gain the opportunity to view television with better pictures and sound quality and greater variety of program choices.[14] Besides the benefits to consumers and broadcasters, there should also be an enormous public interest dividend of released spectrum. The massive investments by broadcasters and consumers will ultimately free up about 200 MHZ of spectrum. DTV has been characterized by some as a spectrum giveaway to the broadcasters. But, **if properly managed, DTV will be a giveback — not a giveaway** — DTV will free up spectrum from broadcast uses while leaving broadcasters whole! DTV will allow our society to move from the excellent, but

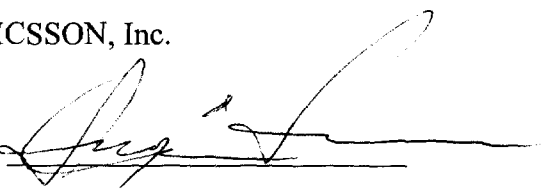
---

[14] Of course, if they wish to exercise this option, consumers will have to invest in converters and sets.

now outdated, analog broadcast technology to a modern and efficient digital technology. Because the new technology will allow more efficient packing of DTV than the older analog technologies, broadcasters can be kept whole with a 6 MHZ channel, while society receives a spectrum dividend. The FCC should move now to implement DTV and should put in place policies that speed the transition to digital television. Broadcasters, consumers, and other spectrum users all are harmed by delay in FCC decision making on DTV.

Respectfully submitted,

ERICSSON, Inc.

By: 

Lars-Goran Larsson
Ericsson, Inc.
1634 Eye Street, N.W.
Washington, D.C. 20006-4083